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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,189	07/29/2003	Daniel Yap	B-4335NP 620890-7	9232

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EXAMINER	
MALKOWSKI, KENNETH J	
ART UNIT	PAPER NUMBER
2613	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/630,189	YAP ET AL.	
	Examiner	Art Unit	
	Kenneth J. Malkowski	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15,19,21,24 and 25* is/are allowed.

6)☒ Claim(s) *1-5, 7-11, 14, 16-18, 20, 22-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 15, 19, 21 and 24-25 are allowed. The following is an examiner's statement of reasons for allowance: With respect to independent claims 19 and 21 the prior art does not fairly teach the limitation of frequency modulating an optical beam comprising the steps of using a plurality of lasers to form an optical beam, injection locking said lasers to a master oscillator, frequency modulating the optical output of the master oscillator before the output thereof is applied to the plurality of lasers, individually controlling the phase of the slave lasers, arranging the plurality of slave lasers in groups, and providing a power oscillator for each group arranged in series between the slave laser and the master oscillator and in combination with all other limitations disclosed in independent claim 19 and 21

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 9 recites the limitation "the plurality of phase shifters" in line 3 of claim 9. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-2, 7, 9-10 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,755,016 to DeLoach et al. in view of U.S. Patent Application Publication No. 2002/0147400 to Chance et al.

With respect to claims 1-2, 7, 14 and 18 DeLoach discloses an optical frequency modulated (column 1 lines 15-33 (invention is meant to produce high powered signals while retaining well defined phase or instantaneous frequency for coherent light-wave fiber-optic systems such as in a frequency modulated system as the frequency of the carrier contains the information)) transmitter comprising: (a) a plurality of slave lasers (Four high powered laser, Fig 2), each of the slave lasers having an output (Figure 2), the outputs of the plurality of slave lasers being combined to form a single output beam of the optical frequency modulated transmitter (outputs of lasers are shown being combined into one signal, Fig 2)(column 1 lines 63-66 (optical paths combined))(column 4 lines 62-64 (means for combining higher power signals of the slave lasers to form an output signal of said transmitter)), the lasers of the plurality of slave lasers being injection locked (column 1 lines 49-59 (the laser master oscillator generates a relatively low power injection locking signal and provided to a plurality of emission devices)) and being separately phased-controlled (columns 1-2 lines 66-68 and 1-4 (optical path length can be adjusted on at least one of the separate optical paths)) and (b) a master optical oscillator which outputs an optical signal for injection locking said plurality of slave lasers (column 1 lines 49-66 (master oscillator, injection signal locks the phase of the light-wave output of the devices to that of the master oscillator)), the optical signal

outputted by the master oscillator being frequency modulated (column 1 lines 16-21 (can be coherently modulated via frequency or phase shift keying)) directly in the master optical oscillator or externally thereof (master oscillator is shown externally modulated in Figures 1 and 2). However, DeLoach fails to disclose applying a bias current or voltage to each laser for adjusting phase thereof relative to other lasers. Chance, from the same field of endeavor discloses a phase an optical transmission system where a bias current or voltage (signal from computer controller 34, Figure 1) which is applied to each slave laser (LD1 – LD4) for adjusting the phase thereof relative to other slave lasers in said plurality of slave lasers (pages 5-6 paragraph 75 (each radiating element is appropriately phased, the phase of the first radiator lags the phase of the second radiator, phases of each radiator can be adjusted to be in-phase))(page 6 paragraph 82 (phasing is controlled by the computer control))(page 7 paragraph 94 (emitters are varied sequentially in phase)) in order to steer the optical beam (page 3 paragraph 57 (criteria for selecting the phases of the respective sources is the shape of the desired beam)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the voltage or current applied to a laser in order to adjust phase as taught by Chance as the form of phase altering used in the transmission system as taught by DeLoach et al. The motivation for doing so is that the principles of beam steering including beam steering via applied voltage is well known in the art as a more precise method of altering phase than other method disclosed by DeLoach, namely adjusting optical path length.

With respect to claims 9-10, DeLoach in view of Chance disclose a transmitter further including an arrangement of a power oscillator (DeLoach: column 1 lines 49-51 (master oscillator)) upstream of a plurality of phase shifters (DeLoach: Figure 2, each phase shifter is the box with the ϕ symbol) and a plurality of lasers (DeLoach: column 3 lines 62-65 (lasers 12 are semiconductor lasers)) and wherein the plurality of slave lasers are injection locked to a power oscillator (DeLoach: column 1 lines 49-66 (master oscillator, injection signal locks the phase of the light-wave output of the devices to that of the master oscillator)). However, Deloach fails to disclose repeating said arrangement in a "plurality of groups." Despite this, creating multiple said arrangements does not constitute a patentably distinct limitation. It would have been obvious to on having ordinary skill in the art at the time the invention was made to repeat the arrangement as disclosed by DeLoach in view of Chance into a plurality of groups. Since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

With respect to claims 16, DeLoach in view of Chance discloses the method of claim 14 wherein the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed in order to steer the optical beam to achieve wavefront coherence of the optical beam (DeLoach: columns 2-3 lines 62-67 and 1-25 wherein feedback error inherently "steers" the optical beam and wherein such steering is created to reduce individual outputs that are out of phase with each other, thereby achieving greater wavefront coherence)).

With respect to claims 22-23, DeLoach in view of Chance discloses the transmitter of claim 7 wherein adjusting the phase of one slave laser relative to other slave lasers in said plurality of slave lasers causes the single output beam of the optical frequency modulated transmitter to be steered (Chance: page 3 paragraph 57 (criteria for selecting the phases of the respective sources is the shape of the desired beam)).

With respect to claim 26, DeLoach in view of Chance discloses the method of claim 18 wherein the step of individually phase controlling DeLoach: column 3 lines 12-25 (feedback signals ensure that the output of slave lasers have the correct phase outputs with respect to each other)) the slave lasers in the plurality of slave lasers is performed by a phase shifter arranged in series between each slave laser (DeLoach: Figure 2, each phase shifter is the box with the ϕ symbol, and each phase shifter has an accompanying laser) in the plurality of slave lasers and the master oscillator (column 1 lines 49-59 (the laser master oscillator generates a relatively low power injection locking signal and provided to a plurality of emission devices)).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,755,016 to DeLoach et al. in view of U.S. Patent Application Publication

No. 2002/0147400 to Chance et al. And further in view of "Multiple Oscillator Locking Via Optical Link," Proceedings of the European Microwave Conference, Paris, pp. 578-583 to Herczeld et al.

With respect to claim 3, DeLoach in view of Chance discloses the transmitter of claim 1, however, DeLoach discloses indirect modulation rather than direct modulation. Herczeld, from the same field of endeavor discloses injecting multiple slave lasers with a high quality master oscillator via injection locking (page 579 paragraph 1) wherein the master oscillator is modulated in response to an application of a modulation current or voltage thereto to thereby modulate the outputted optical signal (page 580 paragraph 2 (one of two forms of modulation can be used in an injection locking method; direct modulation and indirect modulation)). Therefore, it would have been to one of ordinary skill in the art to implement the direct modulation as disclosed by Herczeld where an RF modulation signal is super imposed directly on the laser bias circuit as the type of modulation used on the master oscillator as disclosed by DeLoach in view of Chance. The motivation for doing so would have been that indirect modulation with an external modulator is lossy and limited in power handling capability (DeLoach page 590 paragraph 2). Furthermore, applicant discloses that using direct modulation or indirect modulation are functionally equivalent measures wherein choosing either form of modulation is a simple matter of design choice and that going from one embodiment to the other is an easy modification (page 13 paragraph 2).

With respect to claim 4, DeLoach in view of Chance and further in view of Herczeld disclose the transmitter of claim 3, at least one optical isolator disposed

between said master oscillator and said plurality of slave lasers to prevent unwanted injection of laser light back into the master oscillator from the slave lasers (DeLoach 22, Figures 1 and 2)(DeLoach: column 2 lines 56-62).

With respect to claim 5, DeLoach in view of Chance and further in view of Herczeld disclose the transmitter of claim 4, wherein the master oscillator and the plurality of slave lasers are each optical devices, which output light of a single carrier frequency [on page 4 lines 23-25 of applicants specification, applicant states that having multiple slave lasers injected by the same MO means that all of the said lasers are locked to a single carrier frequency]. DeLoach discloses this same scenario where all of the slave lasers are injected by the same master oscillator (Figure 2)(column 1 lines 59-62 (injection signal locks the phase of the light-wave output of the devices to that of the master oscillator)).

With respect to claim 6, DeLoach in view of Chance and further in view of Herczeld disclose the transmitter of claim 5, wherein the master oscillator and the plurality of slave lasers are provided by distributed feedback lasers (DeLoach: column 4 lines 34-37 (other single frequency lasers can be used, ie. a standard DFB semiconductor laser)).

8. Claims 8, 11 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,755,016 to DeLoach et al. in view of U.S. Patent Application Publication No. 2002/0147400 to Chance et al. and further in view of "High-Performance Phase Locking of Wide Linewidth Semiconductor Lasers by Combined Use of Optical

Injection Locking and Optical Phase-Lock Loop," Journal of Lightwave Technology, Vol. 17 No. 2 February 1999 to Bordonalli et al.

With respect to claim 8, DeLoach in view of Chance and further in view of Bordonalli discloses the transmitter of claim 11 further including a plurality of phase shifters, each phase shifter of said plurality of phase shifter being associated with and coupled upstream of one slave laser of said plurality of slave lasers (DeLoach: Figure 2, each phase shifter is the box with the ϕ symbol, and each phase shifter has an accompanying laser) for further adjusting the phase thereof relative to other slave lasers in said plurality of slave lasers (DeLoach: column 3 lines 12-25 (feedback signals ensure that the output of slave lasers have the correct phase outputs with respect to each other)).

With respect to claims 11 and 20, DeLoach in view of Chance discloses the transmitter of claim 1 wherein the slave lasers are injection locked to the master oscillator, however DeLoach in view of fails to specifically disclose they are each also arranged in a phase locked loop. Bordonalli, from the same field of endeavor discloses master/ slave laser control where the phase laser control uses a phase lock loop wherein the loop acquires the lock when the frequency offset between the maser laser and the slave laser is zero (page 328 column 2 paragraph 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the phase locked loop laser technique as taught by Bordonalli into the slave laser within the system as taught by DeLoach. The motivation for doing so would have been to reduce

errors of phase variance between the master oscillator and the slave laser (Bordonalli: page 341 column 2 paragraph 2).

Response to Arguments

9. Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Malkowski whose telephone number is (571) 272-5505. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KJM 1/27/07

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER